

CLAIMS

1. A system for providing oxygen-depleted environment for fire prevention and fire suppression in enclosed areas, said system comprising:

an enclosing structure having internal environment therein containing a gas mixture which is lower in oxygen content than air outside said structure, and an entry communicating with said internal environment;

an oxygen-extraction device having an inlet taking in an intake gas mixture and first and second outlets, said first outlet transmitting a first gas mixture having a higher oxygen content than the intake gas mixture and said second outlet transmitting a second gas mixture having a lower oxygen content than the intake gas mixture;

said second outlet communicating with said internal environment and transmitting said second mixture to said internal environment so that said second mixture mixes with the air in the internal environment;

said first outlet transmitting said first mixture to a location where it does not mix with the air in the internal environment;

said internal environment selectively communicating with the outside atmosphere and emitting excessive internal gas mixture into outside atmosphere.

2. The system according to claim 1 and

said internal environment being air composition in human visited or occupied areas having oxygen content ranging from 12% to 18%.

3. The system according to claim 1 and

said intake gas mixture is ambient air intaken outside said internal environment.

4. The system according to claim 1 and said oxygen-extraction device employing molecular-sieve adsorption technology in order to extract part of oxygen from said intake gas mixture.

5. The system according to claim 1 and said oxygen-extraction device employing membrane separation technology in order to extract part of oxygen from said intake gas mixture

6. The system according to claim 1 and said enclosing structure being area selected from the group consisting of, but not limited to: rooms and enclosures for data processing and process control equipment, telecommunication switches and Internet servers; banks and financial institutions, museums, archives, libraries and art collections; dwellings, military and marine facilities; aircraft, space vehicles and space stations, marine and cargo vessels; industrial processing and storage facilities operating with inflammable and explosive materials and compositions, and other industrial and non-industrial facilities that require fire safe environment.

7. The system according to claim 1 and said internal environment having climate control.

8. A fire prevention and suppression system for providing low-oxygen atmosphere for industrial and non-industrial applications comprising:

a room comprising a door and wall structure defining a closed space which is accessible through the door, said door being selectively closable so that when closed, the room is substantially isolated from the outside environment;

a gas processing device having an intake and first and second outlets, said device taking in ambient air through said intake and emitting a reduced-oxygen gas mixture, having a

lower concentration of oxygen than ambient air, through said first outlet and enriched-oxygen gas mixture, having a greater concentration of oxygen than ambient air, through said second outlet;

said first outlet being connected with said room so that reduced oxygen gas mixture is emitted into said closed space inside said room;

said gas processing device comprising an air pump and an air separation module receiving ambient air from the intake, said air separation module having a reduced oxygen mixture conduit and an enriched oxygen mixture conduit;

said first outlet being operatively associated with said reduced oxygen mixture conduit and receiving said reduced oxygen gas mixture therefrom, said second outlet being operatively associated with said enriched oxygen mixture conduit and receiving said enriched oxygen gas mixture therefrom and releasing said mixture into the outside environment;

said reduced oxygen gas mixture emitting from said room in amounts necessary to equalize atmospheric pressure inside said room with outside atmospheric pressure

9. The system according to claim 8 and

said reduced oxygen gas mixture inside said room being recycled by a split air-conditioning system in order to control temperature and humidity inside said room.

10. The system according to claim 8 and

said reduced oxygen gas mixture inside said room having oxygen content ranging from 12% to 18%;

said gas mixture having fire retarding capacity and being safe for human respiration.

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said intake being connected to a distribution valve providing distribution of compressed air to multiple inlets communicating each with an individual separation container filled with a molecular sieve material that under pressure adsorbs nitrogen and water vapors, allowing enriched-oxygen gas mixture to pass through into a gas collecting tank communicating with said second outlet and being operatively associated with all said separation containers and receiving said enriched-oxygen gas mixture therefrom;

each said separation container being pressurized and depressurized in cycling manner and releasing during each depressurization cycle said reduced-oxygen gas mixture being delivered into said first outlet.

17. The apparatus according to claim 16 and

said second outlet having release valve allowing to keep said enriched-oxygen gas mixture being collected in said gas collecting tank under increased atmospheric pressure, so when any of said separation containers depressurizes, a portion of said enriched-oxygen gas mixture is released from said tank back into said container purging said molecular sieve material from remaining nitrogen and water.

18. The apparatus according to claim 16 and

said distribution valve being air distribution device selected from the group consisting of electrical, mechanical, air piloted and solenoid valves, both linear and rotary configuration, with actuators controlled by pressure, mechanical spring, motor and timer.

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19. The apparatus according to claim 16 and

said distribution valve being mounted on manifold that is selectively communicating with said multiple separation containers and said first outlet, and selectively allowing periodic access of pressurized air inside said containers and exit of said reduced-oxygen gas mixture therefrom.

20. A fire-extinguishing gas composition for continuous use in human-occupied environments, said gas composition comprising:

said mixture having nitrogen content above 82% but not exceeding 87.6%.

21. The composition according to claim 20 and

said gas composition/being oxygen depleted air with oxygen content of 15%.

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